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ABSTRACT

This study investigated the extent of attitudinal change towards the teaching of science in elementary teachers (N=35) in Trinidad and Tobago during an activity-oriented science curriculum development workshop. The model used during the attempts to: (1) incorporate some aspects of science content development, manipulative hands-on experiences, video-taping, development of self confidence, teach-reteach methodology, and supervisor, peer, and self-evaluation strategies; and (2) to modify the teachers' affective, cognitive, and behavioral responses to elementary science teaching. Results obtained from a 27-item instrument (measuring science knowledge, use of science equipment, interest in science, and apprehension about science teaching) indicate development of positive attitudes in each of the four areas measured. The study shows that the model was effective in producing the desired attitudinal changes and strongly suggests the use of the model in attitude modification research among in-service elementary teachers. Objectives and activities for each day of the workshop are included. (JN)

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THE EFFECT OF PARTICIPATION IN AN ACTIVITY ORIENTED SCIENCE CURRICULUM DEVELOPMENT WORKSHOP ON THE ATTITUDE OF ELEMENTARY TEACHERS IN TRINIDAD AND TOBAGO

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Several techniques have been suggested and utilized by researchers to change the predominantly negative attitude of elementary teachers toward science teaching. These methods include microteaching (Jans, 1974), in-service science education courses (Hone and Carswell, 1969) pre-service content courses (Washton, 1980, Westerback, 1982) activity-oriented elementary science courses (Shrigley, 1974, Kramer 1979). This study attempts to combine facets of these methods in a model aimed at changing the negative attitude of elementary teachers in Trinidad and Tobago.

Trinidad and Tobago are the most southerly of the West Indian Islands and lie very close to the mainland of Venezuela. There are approximately 700 elementary schools with a student population of approximately 250,000. The science knowledge of the teachers ranges from little or no formal exposure to science to five years of secondary science and a science course during in-service teacher training. Elementary education is compulsory for all children between the ages of 5 - 15 years. At age 11+ students write the Common Entrance Examination, success in this examination entitles them to free secondary education. Since 1982 Science has been included in this examination, unfortunately, however a large percentage of our elementary teachers have a negative attitude to teaching science (Fraser-Abder and Shrigley, 1980) and curriculum developers are faced with the task of changing this attitude and also of training teachers to teach science when the teachers have a minimal knowledge of science.

The emphasis in the elementary science curriculmn being developed is on the process approach to science teaching. Teachers have been used throughout the curriculum development phase; they have attended workshops, the major objectives of which were

1. To change the teachers negative attitude to science teaching.
2. To expose teachers to teaching science using the process approach.

3. To involve teachers in planning science lessons for use in the curriculum.

THE STUDY

The purpose of this study was to investigate the extent of science attitudiual change in elementary teachers in Trinidad and Tobago during an Activity-oriented science curriculum development workshop.

INSTRUMENT

The Science Attitude Scale (S.A.S.) for In-service Elementary Teachers (Shrigley and Johnson, 1974) which has been used extensively with North American teachers and previously used to establish the status of the attitude of teachers in Trinidad and Tobago (Fraser-Abder and Shrigley, 1980) was used in this study. This scale was administered as a pretest and posttest to the 35 teachers who attended the workshop. The workshop was held for ten days over a period of seven weeks. The pretest was administered at the start of the first day's activities while the posttest was the final item administered on the tenth day. The 27 items in the scale were categorized into 4 groups dealing with

1. Knowledge of science.
2. Use of science equipment.
3. Interest in Science.
4. Apprehension about teaching science.

Responses to these 4 groups were analysed to determine in which of these areas attitudiual changes might have occurred, using a workshop model specifically designed for the study.

WORKSHOP MODEL

Zimbardo and Ebbesen (1969) categorized attitude into three components: affect, cognition and behaviour. These components must all be

attacked in order to develop an effective attitude change program. This model (Table 1) attempts (1) to incorporate some aspects of science content development, manipulative, hands-on experiences, video-taping, supervisor, peer and self-evaluation, teach re-teach, and development of self-confidence and (2) to modify the teachers' affective, cognitive and behavioral responses to elementary science teaching.

Table 1 - Workshop Model Used To Effect Attitude Change

Day	Activities
1	1. Pre-Test. Science Attitude scale. 2. Introduction to the Process Approach. * 3. Strategies for teaching Elementary Science. * 4. Process Lesson. **
2	1. Overview of elementary science syllabus. * 2. Five groups of 7 teachers plan science lessons. **
3	1. One teacher from each group teaches a lesson to the 34 teachers. ** 2. Item writing based on planned lessons. */**
4	1. Each group teaches lesson to 4 - 5 students. Lessons are video-taped. ** 2. Evaluation of video-taped lessons. *
5-9	1. Each teacher teaches lesson to his/her own class. Lessons are video-taped. ** 2. Evaluation of video-taped lessons. *
10	1. Teachers/Principal's Role in Elementary Science. 2. Science in the Common Entrance Examination. 3. Posttest - Science Attitude Scale.

* Discussion. ** Activity

An in-depth report of the activities and objectives of the workshop follows:-

Day - 1

Objectives:

1. To evaluate teachers attitude toward science.
2. To expose teachers to teaching science using the process approach.
3. To expose teachers to various strategies for teaching elementary science.

Activities:

The S.A.S. was administered at the commencement of the workshop. The Processes and their use in teaching elementary science were discussed. The emphasis was on the importance of the processes, not facts. Activities dealing with each process, the cognitive developmental level of the child and the content required by the teacher to teach science were discussed. Various strategies for teaching elementary science were also discussed. These discussions were brief since they were intended to serve only as an introduction to active involvement by participants in the use of the processes and various teaching strategies.

A Lesson on Parts of a Flower involving the process Defining Operationally was then done with the teachers. They were taught the way they are expected to teach their students.

Day - 2

Objectives:

1. To look at the entire elementary science syllabus.
2. To develop science process lessons for students age 10-11 years.

Activities:

Teachers were given copies of the entire elementary science syllabus and the already development curriculum for age 5-10 years. These were perused with a view to determining what was expected of them at this workshop. The 35 teachere were then divided into 5 groups. Each group planned science lessons according to the following format.

a) Process/Content topic

b) Objectives.

(a & b were given to the teachers).

c) Rationale.

d) Material.

e) Activity.

f) Competency Measure Task.

Day - 3

Objectives:

1. To teach a planned science lesson to fellow teachers.
2. To write questions based on planned lesson.

Activities:

One Teacher from each group taught a planned lesson to the entire group of 34, who acted the role of 10-11 years old students. The lessons were critiqued by the entire group and re-written based on the cirtique. There was then a discussion on item writing, this was followed by each group writing questions based on their planned lessons. It was hoped that this activity would assist teachers in preparing questions for their students.

Day - 4

Objectives:

1. To teach planned lesson to a small group of of students.
2. To evaluate lesson.

Activities:

A class of 10 - 11 yr. old students was brought in and each group taught their lesson to 4 - 5 students. The lessons were video-taped. Based on supervisor, peer and self-evaluation the lessons were modified for use with a larger group in the class room.

Days - 5-9

Objectives:

1. To teach planned lessons to an entire class in a school setting.
2. To evaluate lessons and adapt them to suit varying conditions in the schools.

Activities:

Each teacher taught a lesson to his/her own class. The lesson was video-taped. Based on supervisor, peer and self-evaluation, the lessons were then modified for use with the entire 10-11 yr. old student population.

Day - 10

Objectives:

1. To discuss the role of Principals and Teachers in Elementary Science.
2. To discuss science in the Common Entrance Examination.
3. To evaluate teachers' attitude toward science.

Activities:

The role of Principals and Teachers in Elementary science and problems encountered in the teaching of Science for the Common Entrance Examination were discussed. Finally the Science Attitude Scale was administered.

RESULTS

A comparison of mean and correlated t - test values were used in the analysis of the pre and post test scores. As can be seen from Table 2 the change in overall attitude was very significant; when the items were broken down into 4 categories attitude change also proved to be very significant in each of the 4 categories. The item in each category which showed the largest difference between pre and post test scores is shown in Table 3.

TABLE 2 - Summary of mean and correlated t - test values derived from 27 item Likert-type Instrument designed to measure overall attitude shifts as well as shifts for each of the four sub-sets of statments.

	Overall		Knowledge of Science		Use of Science Equipment		Interest in Science		Apprehension about Science Teaching	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
$\bar{x}$	1.73	4.19	1.86	4.56	1.87	4.12	1.63	4.09	1.66	4.18
s	0.81	0.83	0.84	0.65	0.77	0.83	0.80	0.84	0.82	0.83
t	-65.25 xxx		-29.99 xxx		-30.98 xxx		-35.33 xxx		-36.07 xxx	

TABLE 3 - Mean and correlated t - values derived from responses to one statement in each category of a scale designed to measure Attitude shifts.

Category - Knowledge of Science Content.

Statement - I believe science is too complex for me to understand.

	$\bar{X}$	S	t
Pre	1.88	0.85	-16.06 xxx
Post	4.66	0.53	

Category - Use of Science Equipment.

Statement - I enjoy manipulating science equipment with my students.

	$\bar{X}$	S	t
Pre	1.97	0.56	-13.88 xxx
Post	4.05	0.67	

Category - Interest in Science.

Statement - Science is my favourite subject.

	$\bar{X}$	S	t
Pre	1.37	0.53	-17.72 xxx
Post	4.00	0.67	

Category - Apprehension about Science Teaching.

Statement - I am afraid that I do not have an adequate science backgrcund to teach the subject to children.

	$\bar{X}$	S	t
Pre	1.65	0.63	-16.23 xxx
Post	4.08	0.60	

DISCUSSION AND IMPLICATIONS

Knowledge of Science Content - In the course of the workshop the teachers all made a concerted attempt to improve their science content. The most significant change was noted in those who originally felt that science was too complex for them to understand (Tables 2 and 3). Inadequate science background is commonly given as a reason for teachers' reluctance to teach science (Victor, 1961, Blosser and Howe, 1969). The findings of the National Science Foundation (1980) indicate that in the U.S.A. only 22% of all elementary teachers felt "very well qualified" to teach science, while nearly 66% felt "very well qualified" to teach reading. The results of this study indicate that it is possible to change teachers' attitude to science content using this model.

Use of Science Equipment - In Trinidad and Tobago elementary teachers dislike allowing students to use equipment in the classroom since they consider this to be the source of noise and untidiness. They are also unfamiliar with teaching science using hands-on experiences. The results (Tables 2 and 3) showed that the activities engaged in at the workshop assisted in causing a positive shift in the teachers' attitude toward possession and use of science equipment. It is hoped that this attitude will extend to the classroom even after the workshop is completed.

Interest in Science - At the start of the workshop the teachers expressed little or no interest in teaching science, they preferred to teach Maths and English with which they felt more comfortable. Interest in science among participants became more positive (Tables 2 and 3) as a result of exposure to workshop activities.

Apprehension about Science Teaching - Psychologists point out the importance of anxiety research to educators and terms "Science Anxiety" (Maeroff, 1979) indicate a growing recognition of the role anxiety plays in the avoidance of science teaching. In this study a marked change in attitude was noted in this category (Tables 2 and 3). If as indicated by Perkes (1975) the consequence of apprehension about teaching science is avoidance of teaching it then such a change should result in eagerness to teach science. If this model can bring about such a change it is worthy of being emulated.

The findings of this study suggest further research in this area. Did the teachers involved in this workshop fit their behaviour to the supervisor's perception of a positive attitude toward science teaching? Will this positive attitude continue away from direct supervision? Is the change to a positive attitude long lasting? Will other teachers exhibit such a marked attitudinal change when subjected to similar conditions? It is also possible that teachers in this study might have reacted to their knowledge that the activities involved in during the workshop had a practical value and would be directly applicable to their future teaching. Change might also have been influenced by the nature of the content of the lessons.

The study shows that the model was effective in producing desired attitudinal changes in elementary teachers in Trinidad and Tobago and strongly suggests the use of the model in attitude modification research among in-service elementary teachers.

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